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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/877,906	06/09/2001	Hyeon-Seag Kim	M-11121 US	1914

7590

07/31/2002

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EXAMINER

OWENS, DOUGLAS W

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 07/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/877,906

Applicant(s)

KIM, HYEON-SEAG

Examiner

Douglas W Owens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-9 and 11-21 is/are pending in the application.
- 4a) Of the above claim(s) 14-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-9, 11-13, 20 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election of the invention of group I in Paper No. 3 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Objections

2. Claim 20 is objected to because of the following informalities: Line 5 of claim 20 should be placed before line 4 of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 2 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not teach an epitaxial dielectric layer.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 8 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 8 and 9 recite the limitation, "...equal to ten layers of atomic silicon in thickness..." The scope of the limitation is vague, since the thickness of the atomic silicon layers being used for comparison cannot be determined.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

8. Claims 20, 3 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by US published patent application No. 2002/0014662 to Yamazaki et al.

Regarding claim 20, Yamazaki et al. teaches a semiconductor device,
comprising:

a well (13P);

a channel region in the well;

a dielectric layer (14) overlying the channel region;

a buffer layer (15a) overlying the dielectric layer;

a gate electrode (15b) overlying the buffer layer;
a blocking layer (15c) overlying the gate electrode; and
two source/drain regions of second conductivity type on opposite sides of the channel.

Regarding claim 3, Yamazaki et al. teaches a semiconductor device, wherein the gate electrode comprises silicon germanium.

Regarding claim 4, Yamazaki et al. teaches a semiconductor device, wherein buffer layer and blocking layer comprise silicon.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2, 5 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al.

Claims 2, 5 and 7-9 are obvious over Yamazaki et al.

Regarding claim 2, Yamazaki et al. does not teach a semiconductor device, wherein the dielectric layer, the buffer layer and the blocking layer comprise epitaxial layers. It would have been obvious to one of ordinary skill in the art to use epitaxial layers since it is a known material that is well suited for the intended use.

Regarding claim 5, Yamazaki et al. does not teach a semiconductor device, wherein the substrate (source/drain regions) comprises silicon germanium. Silicon

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germanium is a known semiconductor material that would have been obvious to use since it is well suited for the intended use.

Regarding claim 7, Yamazaki et al. does not teach a semiconductor device, wherein the gate dielectric comprises, zircon oxide, titanium oxide, tantalum oxide or hafnium oxide. It is known in the art that high dielectric constant oxides are desirable for use in MOS transistors since an oxide having a thickness that is greater than the thickness of a silicon oxide can be formed that performs like a much thinner silicon oxide dielectric. Zircon oxide, titanium oxide, tantalum oxide and hafnium oxide are known high dielectric constant oxides which would have been obvious to use since they are well suited for the intended use.

Regarding claims 8 and 9, it is considered a matter of obvious to arrive at the optimal thickness of semiconductor layers through routine experimentation.

11. Claims 21 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US patent No. 5,880,508 to Wu in view of Yamazaki et al.

Regarding claim 21, Wu teaches a semiconductor device comprising:

- a channel region of a first conductivity type;
- a dielectric layer (8) over the channel;
- a gate electrode (12) over the dielectric layer; and
- two source/drain regions on opposite sides of the channel region.

Wu does not teach a semiconductor device, wherein the substrate (source/drain regions) comprises silicon germanium. Silicon germanium is a known semiconductor material that would have been obvious to use since it is well suited for the intended use.

Regarding claim 11, Wu teaches a semiconductor device, wherein the gate electrode comprises a metal.

Regarding claim 12, Wu does not teach a semiconductor device, wherein the source/drain regions have a depth of 100 to 1000 Angstroms. It would have been a matter of obviousness for one having ordinary skill in the art to arrive at the optimal depth of the source/drain junctions through routine experimentation.

Regarding claim 13, Wu does not teach a semiconductor device, wherein the source/drain regions comprise amorphous material. It would have been a matter of obviousness to use amorphous material since it is a known material that is well suited for the intended use.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US published patent application, 2001/0020723 to Gardner et al. discusses the desirable practice of using high-k gate dielectrics in section [0014] of column page 2 through section [0015].

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

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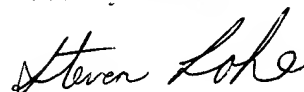
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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DWO
July 29, 2002

Steven Loke
Attorney at Law

A handwritten signature in cursive script that reads "Steven Loke".